

THE KENYA NATIONAL EXAMINATIONS COUNCIL
Kenya Certificate of Secondary Education



232/1

PHYSICS (Theory)

Nov. 2023 – 2 hours

Serial No.

26359626

Name: **Index Number:**

Candidate's signature: **Date:**

Instructions to candidates

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) This paper consists of **two** sections; **A** and **B**.
- (d) Answer **all** the questions in sections **A** and **B** in the spaces provided.
- (e) **All working must be clearly shown in the spaces provided in this booklet.**
- (f) Non-programmable silent electronic calculators may be used.
- (g) **This paper consists of 12 printed pages.**
- (h) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
- (i) **Candidates should answer the questions in English.**



For Examiner's Use Only

Section	Questions	Maximum Score	Candidate's Score
A	1 - 13	25	
	14	11	
B	15	11	
	16	11	
	17	11	
	18	11	
Total Score		80	



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SECTION A (25 marks)

Answer all the questions in this section in the spaces provided.

- 1 State one way in which Physics contributes to the study of History. (1 mark)

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- 2 It is observed that diffusion is faster in gases than in liquids. State the reason for this observation. (1 mark)

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- 3 A boarding school has two identical tanks A and B filled with water. All the surfaces of tank A are painted silvery shiny while the surfaces of tank B are painted black. It is observed that, for bathing in the morning, most of the students prefer fetching water from one particular tank.

- (a) Identify the tank preferred by the students in the morning. (1 mark)

- (b) Explain why students prefer to use water in the tank identified in 3(a). (2 marks)

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- 4 Figure 1 shows a uniform metre rule of negligible weight pivoted at the 40 cm mark. It is kept at equilibrium by a spring balance attached at the 100 cm mark and force F at the 60 cm mark.

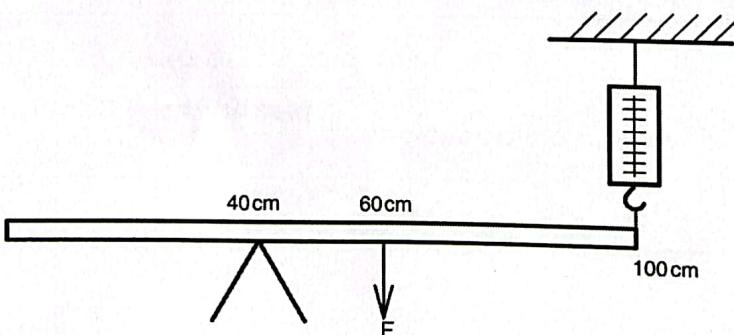


Figure 1

The reading on the spring balance is 1 N. Determine the value of F.

(3 marks)

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- 5 A mass of 40 g is suspended from a spring causing it to stretch. When a 20 g mass is added to it, the spring stretches further by 1.6 cm. Determine the spring constant. (gravitational field strength $g=10 \text{ Nkg}^{-1}$) (2 marks)
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- 6 Figure 2 shows a test tube containing air and fitted with a sliding cork. The tube is suspended horizontally by a thread.

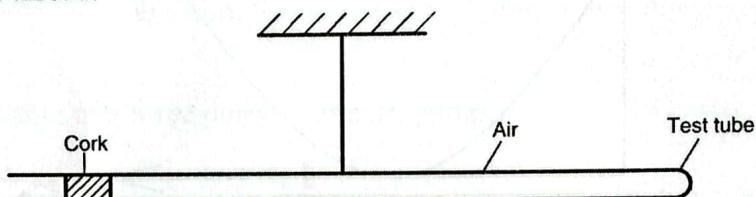


Figure 2

When the test tube was heated slightly, the cork moved and the tube tilted.

- (a) State the direction in which the tube tilted. (1 mark)
-

- (b) Explain why the tube tilted as in 6(a). (2 marks)
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- 7 Figure 3 shows two identical tennis balls K and L moving in air. Ball K spins as it moves while ball L does not.

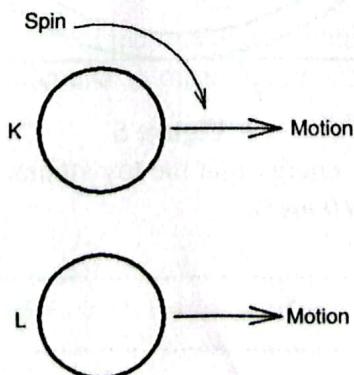


Figure 3

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It is observed that ball K falls down faster than ball L. Explain this observation.

(3 marks)



- 8 **Figure 4** shows a velocity - time graph of a certain object.

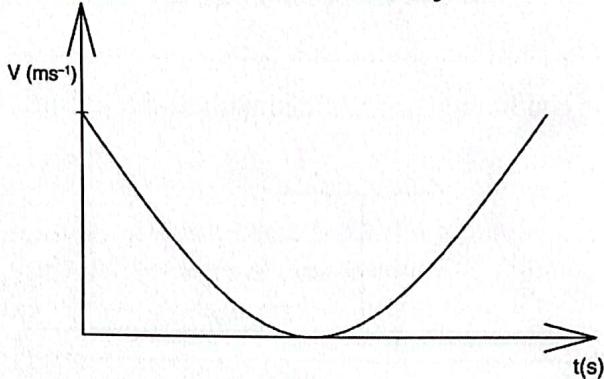


Figure 4

Describe the motion of the object.

(2 marks)



- 9 **Figure 5** shows a toy car of mass 250 g moving from rest on a curved frictionless bowl of height 0.2 m.

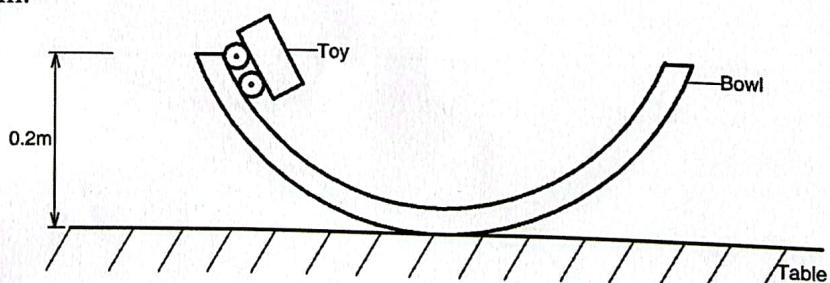


Figure 5

Determine the maximum kinetic energy that the toy attains.
(gravitational acceleration g is 10 ms^{-2}).

(3 marks)

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- 10 State **one** factor that determines the speed at which a car negotiates a level circular path. (1 mark)
-
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- 11 A student observed that a burn by steam from boiling water was more severe than a burn by the boiling water. State the reason for this observation. (1 mark)
-
.....



- 12 State **one** advantage of a force pump over a lift pump. (1 mark)
-
.....

- 13 State **one** possible source of error that may occur when carrying out an experiment to verify Charles' Law. (1 mark)
-
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SECTION B (55 marks)

Answer all the questions in this section in the spaces provided.

- 14 (a) State **two** properties of alcohol that make an alcohol thermometer more suitable than a mercury-in-glass thermometer in measuring temperature. (2 marks)
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- 6
- (b) Figure 6 shows Six's maximum and minimum thermometer.

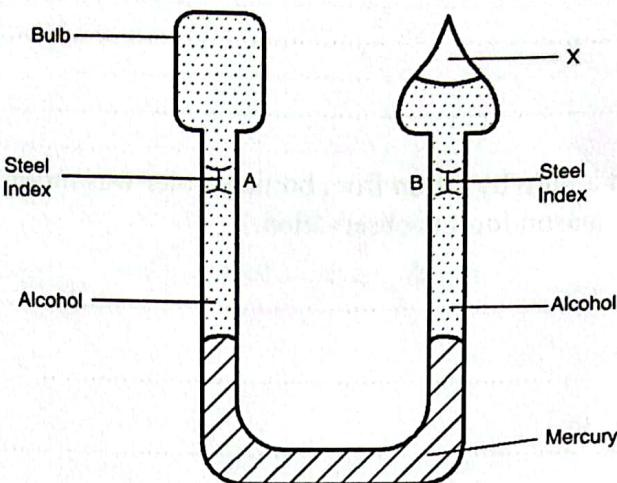


Figure 6

- (i) State the purpose of the:

I. part labelled X;

(1 mark)

II. mercury.

(1 mark)

- (ii) State the reason why indices A and B are made of steel.

(1 mark)

- (iii) Explain how the maximum temperature for a given day is determined using this type of thermometer.

(3 marks)

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- (iv) State the reason for the shape of the meniscus of mercury in **Figure 6**. (1 mark)

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- (c) **Figure 7** show a cork stuck in the neck of glass bottle.

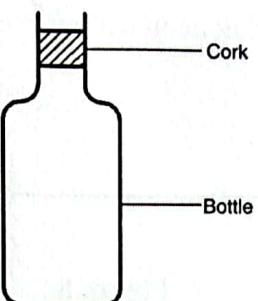


Figure 7

Explain how the cork can be removed from the bottle without breaking the bottle or the cork. (2 marks)

- 15 (a) Explain the following observations:

(i) A trolley moving on a bench in a straight line eventually comes to rest; (2 marks)

(ii) A passenger is jerked forward when a vehicle is suddenly stopped. (2 marks)

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- (b) **Figure 8** shows a graph of velocity against time for two identical ball bearings dropped into water and glycerine.

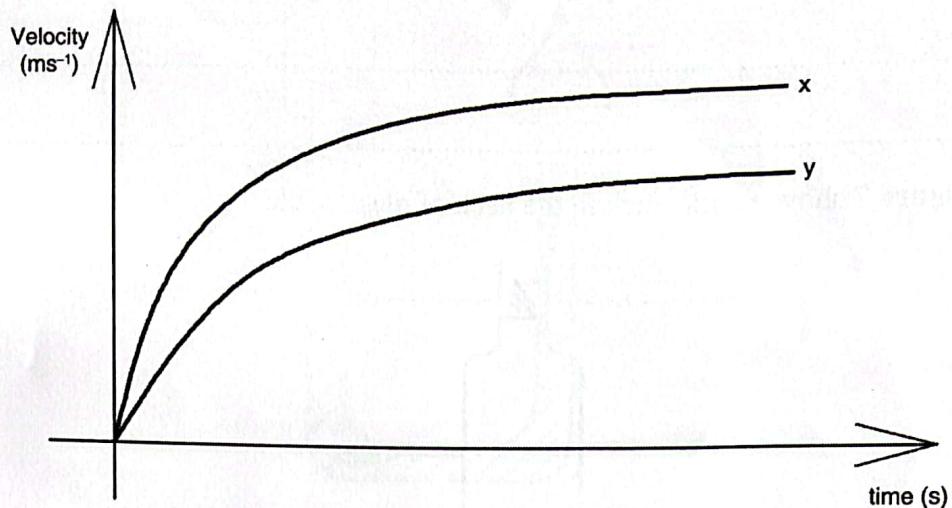


Figure 8

State with a reason which of the two curves x or y shows the velocity of the ball bearing falling through water.

(3 marks)

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- (c) **Figure 9** shows a student of mass 60 kg standing on a weighing balance calibrated in newtons in a lift. The lift is accelerating upwards at 0.25 ms^{-2} .

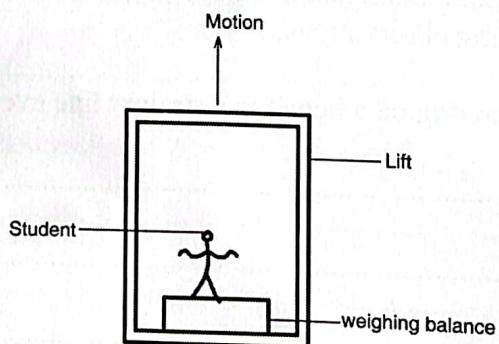


Figure 9

Determine the reading on the weighing balance.

(3 marks)

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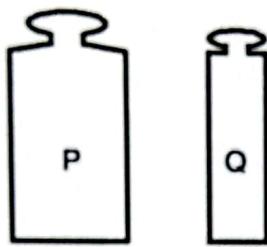
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- (d) State one way of reducing frictional force experienced by an object sliding on a flat surface.

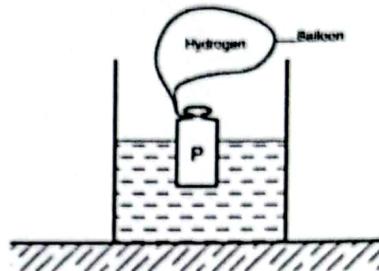
(1 mark)



- 16 (a) Figure 10 (a) shows two similar bottles P and Q of the same weight while Figure 10 (b) shows bottle P kept afloat in water using an inflated balloon.



(a)



(b)

Figure 10

Bottle P in Figure 10 (b) is then replaced with bottle Q in Figure 10 (a).

- (i) State what is observed on bottle Q.

(1 mark)

- (ii) Explain the observation in part (i).

(2 marks)

- (b) A piece of metal weighs 0.6 N in air and 0.5 N when fully submerged in water. When the metal is fully submerged in liquid L, it weighs 0.54 N. Determine the:

- (i) relative density of the metal.

(3 marks)

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(ii) relative density of liquid L.

(3 marks)

.....



(iii) density of liquid L.

(2 marks)

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- 17 (a) In an experiment to estimate the diameter of an oil molecule, an oil drop of volume $6.55 \times 10^{-5} \text{ cm}^3$ was placed on the surface of water. The oil spread to form a circular patch of diameter 8 cm.

(i) Determine the:

I. area of the oil patch;

(2 marks)

.....

II. diameter of the oil molecule.

(3 marks)

.....

(ii) State two assumptions made in such an experiment.

(2 marks)

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- (iii) State any two possible sources of error in the experiment. (2 marks)

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- (b) Describe how the experiment in 17(a) could be used to determine the extent of accidental oil spillage in the sea. (2 marks)

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- 18 (a) Figure 11 shows two liquids L and M each of mass 1 kg in identical containers. Liquid L has higher heat capacity than liquid M.

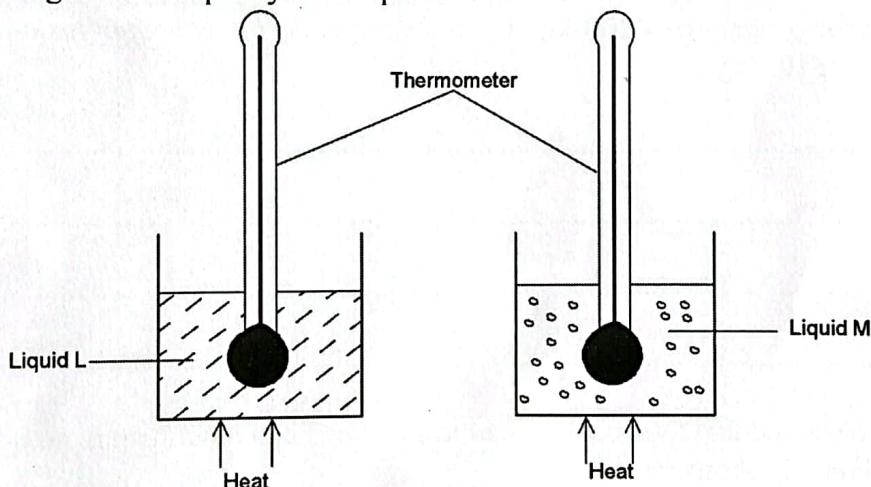


Figure 11

The liquids are heated with the same amount of heat for the same length of time.

- (i) State the observation made on the readings of the two thermometers. (1 mark)

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(2 marks)

- (a) (ii) Explain the observation in part (i).

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- (a) (iii) State
- two**
- ways in which heat losses in the two calorimeters can be minimized. (2 marks)

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- (b) A block of ice at
- 0°C
- and of mass 5 g is placed into a calorimeter containing 50 g of water at
- 25°C
- . If all the ice melted, determine the final temperature of the mixture. (Assume that negligible heat is absorbed by the calorimeter). Take the specific heat capacity of water as
- $4200\text{Jkg}^{-1}\text{k}^{-1}$
- and the specific latent heat of fusion of ice as
- $3.5 \times 10^5 \text{ Jkg}^{-1}$
- (4 marks)



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- (c) It is observed that food cooks faster in a covered container than in an open container. Explain this observation.

(2 marks)

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